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"Pathways to the Bomb: Security of Fissile Materials Abroad"

A Hearing before the Committee on Homeland Security
Subcommittee on Prevention of Nuclear and Biological Attack
U.S. House of Representatives
June 28, 2005

Thank you, Mr. Chairman and distinguished Members of the Committee, for this opportunity to appear before the House of Representatives Committee on Homeland Security, Subcommittee on Prevention of Nuclear and Biological Attack. Today we are discussing with you the vital issue of fissile material that is located in as many as 46 countries around the world. According to the General Accounting Office, 128 research reactors or associated facilities worldwide have 20 kg or more of highly enriched uranium (HEU), which would likely be the material of choice for illicit bomb-makers, because it is easier to fashion into a simple device than its sister material, plutonium.[1] Many of the facilities where HEU is found are devoted to scientific research and development, or they are engaged in the production of isotopes for cancer and other medical treatments. Therefore, they frequently serve an important role in the scientific endeavor of the state where they are located, or in the health and welfare of its public.

Against this positive picture must be balanced the threat that fissile materials pose when they are located at far-flung facilities, some of them in politically troubled or even unstable countries. In a recent study, a RAND Corporation research team highlighted how Aum Shinrikyo and Al Qaeda, two notorious, widely dispersed terrorist groups, had worked hard throughout the 1990s to acquire nuclear materials for weapons. Although they ultimately appeared to have failed in that period, the ambition of terrorist groups to do so no doubt remains strong. Indeed, the third case study that the RAND team describes is one involving a research reactor in Kinshasha, Zaire, from which two nuclear fuel rods were stolen in the 1970s, one of which eventually ended up being offered for sale to the Italian Mafia. Thus, the supply and demand sides both remain active.[2]

It is this intersection between known terrorist interest in acquiring bomb-making materials and small caches of these materials in widely dispersed facilities around the world that led to the creation of the Global Threat Reduction Initiative (GTRI) in the Department of Energy. While states can be deterred from using nuclear weapons by fear of retaliation, terrorists, who have neither land, people nor national futures to protect, may not be deterrable. Terrorist acquisition of nuclear weapons therefore poses the greatest single nuclear threat. And the gravest danger arises from terrorists gaining access to stockpiles of fissile materials, because acquiring a supply of nuclear material remains the most difficult challenge for a terrorist group.

So-called outlaw states are not the most likely source. Their stockpiles are small and precious, and hence well-guarded. They are not likely to give away what they see as the crown jewels in their security crowns. Rather, the most likely sources of nuclear materials for terrorists are storage areas in the states of the former Soviet Union and in Pakistan, and fissile material kept at these dozens of civilian sites around the world.[3]

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[1]General Accounting Office, "Nuclear Nonproliferation: DOE Needs to Take Action to Further Reduce the Use of Weapons-Usable Uranium in Civilian Research Reactors," July 30, 2004, p. 28, found at http://www.gao.gov/new.items/d04807.pdf, accessed June 26, 2005.

[2] Sara Daly, John Parachini, William Rosenau, "Aum Shinrikyo, Al Qaeda, and the Kinshasa Reactor: Implications of Three Case Studies for Combating Nuclear Terrorism," Documented Briefing, RAND Project Air Force, 2005. Zaire is now called the Democratic Republic of Congo.

[3] This "Global Nuclear Threat Assessment" is further discussed in George Perkovich, Jessica T. Mathews, Joseph Cirincione, Rose Gottemoeller, and Jon B. Wolfsthal, *Universal Compliance: A Strategy for Nuclear Security*, Carnegie Endowment for International Peace, March 2005, pp. 26-32.

GTRI concerns itself with fissile materials stored at sites that were built both with U.S. and Soviet assistance. During the Cold War, these two nuclear arch-rivals competed for influence by providing "peaceful nuclear assistance," supplying research reactors to countries around the world in the interest of drawing them closer. In the U.S. case, this was done under President Eisenhower's Atoms for Peace program. The Soviet program was very similar in its rationale. In fact, as the RAND study puts it, "the competition between the United States and the USSR …in many ways led to creation of the International Atomic Energy Agency (IAEA)…to monitor and inspect these facilities, and to prevent the proliferation of nuclear weapons."[4]

It is thus to be applauded that a decade and a half after the break-up of the Soviet Union, the United States and Russian Federation have joined together to try to address this dangerous Cold War legacy. This effort began in the 1990s, with efforts to establish priority projects to return highly enriched uranium from former Soviet facilities to safe-keeping. The earliest was the very successful 1994 Sapphire Project, in which the United States, working together with Kazakhstan and Russia, removed 581 kgs of HEU from Kazakhstan to storage and eventual disposition in the United States. This material had been apparently been scouted by Iranian agents, and empty canisters marked with Tehran addresses were found in the room next to where the material was stored.[5] A similar project, "Auburn Endeavor," was carried out in Georgia in 1998, although it involved less than 5 kgs of highly enriched uranium.[6] This material was taken for safe storage to the United Kingdom.

The difficulty with expanding beyond these early cases was that the effort fell prey to an uncertain legal environment in the Russian Federation as well as the necessity of arduous and lengthy negotiations to set down procedures and arrangements for the material to be moved. Only after 2001 did the legal situation improve, when the Russian Duma passed a package of laws permitting the return of spent fuel to Russia. However, implementation of these laws in Russia has continued to be very difficult, with public protests and uncertainty about the purview of the legal regime playing a strong role.[7]

As for the United States, it had long had a program to return HEU fresh and spent fuel from research reactors that it had built under the Atoms for Peace program. It also had a program, the "Reduced Enrichment for Research and Test Reactors" or RERTR program, to develop low enriched uranium (LEU) fuel for such reactors and provide for their conversion. The difficulty was that these programs were at a low level of priority, visibility and funding—not at all commensurate with the serious threat that they were trying to confront.

A nongovernmental organization, the Nuclear Threat Initiative, undertook an important initiative to raise the profile of this effort after 2000, providing some significant funding to supplement and assist the U.S. and Russian government programs. The first success of this public-private partnership was the removal of HEU fuel from the Vinca research reactor in Belgrade in August

[4] "Aum Shinrikyo, al Qaeda, and the Kinshasa Reactor," p. 54.
[5] For more on Project Sapphire, see http://www.nti.org/db/nisprofs/kazakst/fissmat/sapphire.htm, accessed July 18, 2005.
[6] For more on Auburn Endeavor, see http://www.nti.org/db/nisprofs/georgia/auburn.htm, accessed July 18, 2005.
[7] For more on the Russian legal scene, see http://www.nti.org/db/nisprofs/russia/reactor/waste/snf.htm, accessed June 26, 2005.

2002.[8] The NTI involvement served as an important catalyst to accelerate the government effort, but it still labored in an environment of disparate bureaucratic actors and agencies and uncertain budgets.

Therefore, it is to the great credit of the Bush Administration that in May 2004, they established a coherent program, the Global Threat Reduction Initiative or GTRI. The Administration drew together offices and activities that had existed in various parts of the Department of Energy, and began the work needed to establish a stable budget at higher levels of funding. The budget request for FY 2006 was a net increase of $4.3 million over FY 2005, to $98 million.[9]

Difference with Administration Approach

The Bush Administration deserves praise both for drawing together a number of disparate U.S. government projects into a comprehensive program, the Global Threat Reduction Initiative, and for involving the Russian Federation effectively in the effort. Where we differ with the Administration, however, is in their sense of the speed with which GTRI can be carried out. At the Carnegie Endowment, I recently participated in a comprehensive study on the future of the nonproliferation regime, *Universal Compliance*, in which we laid out the case for an accelerated GTRI, or as many in the expert community call it, an "accelerated global clean-out." We argue that the United States, Russia and other partner countries should vigorously identify, secure, and remove nuclear material from all of the most vulnerable sites within four years, or by 2008.[10]

By contrast, current Administration plans call for implementing GTRI goals within ten years. In our view, this is perilously slow: civilian research reactor facilities are the most vulnerable sources of nuclear materials worldwide, especially to terrorists who are bent on acquiring the bomb. Forty-six countries are known to possess weapon-usable uranium, and an estimated 50 metric tons are currently being held as stocks for power and research reactors.[11]

We simply do not have the luxury of a ten-year program, if we believe that terrorists will target for theft such fissile materials stored at remote locations. It may be their best shot at stealing enough nuclear explosive material to immediately construct a nuclear weapon or improvised nuclear device that could be exploded in a U.S. city.

The Carnegie team argues in *Universal Compliance* that the major obstacles to faster implementation of the program are inadequate staffing and financing, and a disproportionate emphasis on conversion—rather than shutdown—of older, unnecessary facilities. A recent

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[8] For more on the Vinca operation, see http://www.nti.org/e_research/profiles/Yugoslavia/index_3977.html, accessed July 18, 2005.

[9] William Hoehn, "Preliminary Analysis of the U.S. Department of Energy's Fiscal Year 2006 Nonproliferation Budget Request," RANSAC Policy Update, February 9, 2005, found at http://www.ransac.org/Publications/Congress%20and%20Budget/index.asp, accessed June 26, 2005. It should be noted that GTRI was forced to absorb some programs with no additional funding.

[10] *Universal Compliance*, p. 89. It must be emphasized that we are not arguing that HEU can be removed from all HEU-fueled research reactors in four years. Some will require a process of conversion to LEU fuels that will take longer. However, HEU can be removed from the most vulnerable sites, and security upgrades can be completed at sites that are not possible to convert to LEU in that time.

[11] See Tables 4.1 and 4.2, *Universal Compliance*, pp. 86-87.

Harvard study, *Securing the Bomb 2005*, also argues that most of the world's research reactors are aging and unneeded. It notes that 56 HEU-fueled research reactors are currently considered too difficult to convert to LEU. A carefully developed package of incentives could provide the needed impetus to increase the number of reactor shut-down projects, as long as it is crafted in such a way that it will not be considered anti-science or anti-nuclear by the world nuclear community.[12]

Thus, more creative approaches, such as engaging a larger number of international partners, developing more innovative contracting, and undertaking multiple operations simultaneously, are needed. With the necessary resources and emphasis, the ten-year goal can—and should—be met in four years.[13]

It is worth emphasizing that the cost of removing fissile material from vulnerable sites around the world need not be large, but it is still subject to a number of uncertainties.[14] The current GTRI program provides funding for the security of radiological sources, and for security upgrades at the sites. Thus, the budget required for *removing* fissile materials from vulnerable sites must be distinguished from those programs. In addition, the total cost of removing materials must take account of what tools or incentives will be required to overcome the natural reluctance of decision-makers, scientists and facility managers to give up their HEU. They are likely to be concerned about whether they will be able to achieve the same research or isotope production results without it.

However, given the urgency of the mission in addressing this horrific threat, *an increase of $30-40 million per year over the Administration's $98 million FY 2006 request seems justified.* A stable and reliable funding base at this level would permit accelerated work to be accomplished in four years.

A key factor in this acceleration will be judicious negotiation of incentives. We believe that the success of an accelerated global clean-out depends to a great extent on achieving more intensive and nuanced diplomacy than we have engaged in to this point. The countries that should be contemplating a quick removal of HEU from their nuclear research programs will have to be assured that their national interests will continue to be served if they agree to this course. Indeed, they should perceive that their interests will be accomplished even more effectively than before.

Two directions in U.S. policy should be pursued to make this more intensive and nuanced diplomacy possible. The first has to do with the package of tools that the United States puts to

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[12] Matthew Bunn, Anthony Wier, *Securing the Bomb 2005: The New Global Imperatives*, Nuclear Threat Initiative and the Project on Managing the Atom, Harvard University, May 2005, available at http://www.nti.org/e_research/report_cnwmupdate2005.pdf (accessed June 27, 2005).

[13] *Universal Compliance*, p. 89-90. See also Matthew Bunn, Anthony Wier, and John P. Holdren, *Controlling Nuclear Warheads and Materials: A Report Card and Action Plan*, Nuclear Threat Initiative and the Project on Managing the Atom, Harvard University, March 2003, available to www.nti.org/e_research/cnwm/overview/report.asp (accessed April 27, 2004).

[14] In the FY 2005 authorization for the programs, Congress required a report that is to include a plan for removal of vulnerable nuclear material around the world, and an estimate of the costs of implementing such a plan. Since this report would be based on the full range of information available to the U.S. government, it will be important for confirming any estimate of the total budget required for the removal of fissile material from vulnerable sites.

work at the negotiating table. The second has to do with the structure of the teams involved in the negotiations. Let us examine these in turn.

Negotiating Tools

Although GTRI has achieved some successes in the 13 months since its creation—small quantities of HEU have been removed from Libya, Uzbekistan, the Czech Republic and Latvia—the program in some cases has left the job half done. In Libya, for example, once the highly enriched uranium was taken to the United States, the U.S. promised to convert the Libyan research reactor, providing it with an LEU core. This promise thus far has not been fulfilled.

In other cases, the deal has been structured in a way to make it more expensive or complicated to carry out. The highly enriched uranium from the reactor in Latvia, for example, was sent to the United States on a special transport plane. It could have been transported to France, like Latvia an EU member state, on a commercial basis, thus achieving cost savings and speeding up the process.

In yet other cases, the U.S. negotiators did not have the resources readily available to offer a clear path forward to the negotiating partner. For example, although the HEU was removed from the Vinca reactor in Belgrade in 2002, no conversion of the reactor has taken place, nor has the spent fuel been removed, nor have cooperative research activities materialized with the scientific staff at the facility. The United States has simply not had the flexibility with its existing funding to move forward in these promised areas.

Of course, one might say that the main goal at Vinca has been achieved, the removal of the HEU, and in Libya as well, and the United States need not bother with these lesser activities. If the U.S. proceeds in this way, however, it will have a very negative impact on the willingness of other countries to part with their HEU. In order to succeed with a global clean-out, the United States must first and foremost pursue a comprehensive effort that responds to the national interests of its negotiating partners.

These examples suggest some tools that the U.S. should put in place to succeed with a comprehensive effort:

1. The United States should ensure that it undertakes a thorough examination of the least-cost, most efficient means and methods to achieve success in a take-back project. In doing so, the U.S. should take into account the views of its negotiating partner. In some cases, other countries beyond Russia (e.g., in the EU) might be capable of moving the material more quickly and efficiently, and for less cost. A larger international circle involved in the GTRI is entirely consistent with the goals and rationale of the Global Partnership against the Spread of Weapons and Materials of Mass Destruction, which was begun as a G-8 effort in 2002, but has now spread to a wider community of countries.[15]

[15] Information about the reach of the Global Partnership beyond the G-8 may be found at www.state.gov/t/np/rls/fs/34967.htm (accessed January 10, 2005).

2. Likewise, full account should be taken of the non-governmental organizations and commercial companies that are engaged in these issues, and the services that they are able to offer. In many cases, they will have well-established relationships that might help to achieve greater efficiencies, or provide good contacts to speed the negotiations. It is often said that the time taken to achieve mutual confidence at the negotiating table is time well-spent, but if another entity, including a non-governmental one, can provide good entrée to a country's decision-makers and reactor operators, then that entrée should certainly be tapped to accelerate the process. This point has already been borne out by the positive impact that the Nuclear Threat Initiative, a non-profit entity, has had on implementation of HEU take-back projects.
3. In either the government or non-government case, close attention should be paid to means and methods to speed up the contracting process, for delays in that arena can easily turn into a source of frustration for the negotiating partner. Ample experience in contracting and subcontracting has been gained in recent years in the material protection, control and accounting; the plutonium reactor shutdown; the launcher elimination; and other bilateral programs with Russia. This experience should be tapped for ways to ease the delays in contracting that have dogged the GTRI program, which in turn will translate into greater flexibility and progress at the negotiating table.
4. Another issue for negotiators has been the limited flexibility that they have had with regard to the use of funds. For example, a deal might be struck to purchase HEU fuel from a country, as long as it was part of a comprehensive package to also remove spent fuel and convert and clean-up the facility site. This was the preferred course for the Yugoslav team at the Vinca reactor in Belgrade. However, as mentioned above, only the HEU part of the equation has been fully solved at this point. With this glaring example hanging over new negotiations that are undertaken, it is clear that in order for the United States to succeed, its negotiators will need additional flexibility in offering to expend funds, to address spent fuel, conversion, and possibly clean-up of facilities. This is a key area where the Congress could help, by providing more flexibility in the authorities available to the GTRI program.
5. Often, a key factor slowing the negotiations has been the availability of funds for a goal of paramount importance to the partner country, ensuring that its nuclear scientists will continue to have interesting work to do, despite the removal of HEU from their territory. This was a very important issue in one of the earliest negotiations, Auburn Endeavor, in which fresh and spent HEU fuel was removed from a reactor site in Georgia. Afterwards, Georgian scientists came to the United States to establish research contacts with U.S. counterparts, and some joint projects were undertaken. Thus, as a result of cooperation with the United States to remove HEU from Georgian territory, Georgian scientists benefited. Ideally, such measures should be agreed in the course of negotiating a take-back program. They should be designed to give the partner country an active program of cooperation that would strengthen its science and technology base.

Although some of these tools might require additional funding, others could be funded from existing programs or draw on existing funding sources. For example, up to $50 million was made available in the FY 04 Defense Authorization bill for cooperative threat reduction work

outside the former Soviet Union.[16] Funds of this type could be used for exchanges involving scientists at research reactor facilities participating in the GTRI program. This is a good example of a situation where it will be important to ensure that the Administration has adequate flexibility to use existing funds for the purpose of speeding up the GTRI program.

In some cases, making use of these tools will simply require more flexibility in U.S. government procedures and operations. For example, the recent difficulties that scientists have had in gaining visas to study and conduct research in the United States are well-documented, most recently in a report by the American Civil Liberties Union (ACLU). This report showed a 28% drop in applications to U.S. universities from foreign graduate students in 2003, and an 18% drop in admissions.[17]

Although it would be most beneficial for this issue to be resolved in a comprehensive manner, in the interest of progress in U.S. science and technology overall, a special visa program might have to be devised for purposes of speeding up the GTRI program. Undoubtedly, such a program would be in the overall national security interest of this country, if it contributes to an accelerated return of highly enriched uranium to safe storage and disposition in the United States.

The United States, it is important to stress, should not be the only country deploying these tools. The Russian Federation, as a key player in the Global Threat Reduction Initiative, should also be willing to provide research opportunities, including smoothing the way for visas and other administrative arrangements in Russia. In addition, countries in Europe and Asia that are members of the Global Partnership might be involved in providing research facilities for scientists from GTRI partner countries, as part of their contributions to the Global Partnership. Thus, the responsibility for implementing GTRI would expand, as it should, to additional countries. Given the dire threat that dispersed HEU poses, such an approach would provide a way for these countries to take low-cost action in the interest of all.

Team Structure

In addition to these tools for the negotiating table, the effort to accelerate GTRI will require more intensive diplomacy than has been conducted up to this point. Currently a rather small group of individuals in the Departments of State and Energy is responsible for the diplomacy required to move HEU back to the United States. As effective as those individuals might be in engaging any country, they can only negotiate in a single capital at a time. This "one at a time" approach contributes not only to the slowing of the overall process, but also contributes to fatigue, sometimes severe, among those involved, as they have to prepare for negotiations in one country after another.

For that reason, I recommend that Global Threat Reduction Initiative be permitted to recruit additional personnel, in order to be able to intensify the pace of the diplomatic activity. They need not be hired on a full-time basis, but could be brought on board on time-limited contracts.

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[16] See Section 1308 of the National Defense Authorization Act of Fiscal Year 2004 (PL 108-136;117stat.1662;22USC 5963).

[17] This report of the American Civil Liberties Union, *Science under Siege*, may be found at http://www.aclu.org/Privacy/Privacy.cfm?ID=18534&c=39, accessed June 26, 2005.

Experienced individuals should be sought—for example, retired diplomats who have dealt with nuclear nonproliferation issues, as well as technical personnel who have perhaps served with the International Atomic Energy Agency (IAEA) or with the U.S. nuclear laboratories. In that way, GTRI could acquire a considerable amount of additional expertise quickly, both in terms of the technical matters involved, and in terms of negotiating experience.

This expanded group of diplomats and experts should then be structured in an effective manner. Based on the experience of Project Sapphire, I recommend the formation of *"tiger teams."*

The tiger team concept emerged out of necessity, in the summer of 1994, when the U.S. government first discovered the Sapphire material—as mentioned above, 581 kgs of highly enriched uranium, material that could produce 20-25 bombs. This material had been abandoned at a remote facility in Kazakhstan and had already been scouted by Iranian agents. Kazakhstan's leaders, to their credit, urgently asked for U.S. assistance in removing the material to safekeeping. Winter would soon close in. They feared that if the HEU was not removed before snow fell, it would be gone—stolen or illicitly sold—by the time spring arrived. The United States, working together with Kazakhstan and the Russian Federation, had three months to get the job done.

Because of this urgency, the United States formed a group of mid-level government officials and laboratory personnel, who collectively had significant experience in solving problems and overcoming bureaucratic barriers in their agencies. They were given a clear deadline and task: all of the HEU had to be flown out of Kazakhstan by the end of November 1994. They were also given authority to pledge resources on behalf of their agencies, and direct lines of communication to a high-level interagency group that was based in the National Security Council and could help them to quickly solve roadblocks.

This Sapphire tiger team was able to solve a myriad of problems quickly, from technical details on the ground in Kazakhstan—what types of transport containers should be used, and how would transport aircraft land?—to domestic legal questions in the United States. They also were involved in multilevel diplomacy, which involved Kazakhstani technical experts on the ground at the site, senior decision-makers in Almaty, and also senior decision-makers in Moscow and Washington. Their ability to take responsible decisions, or move them quickly up the chain if they could not, was a vital factor in enabling the Sapphire operation to be completed on time.

I would like to emphasize the role of on-going links to high-level decision-makers, because that is the factor that contributed most strongly to the success of the tiger team in Project Sapphire. It is unrealistic for top officials to be routinely engaged in implementing a program—they simply have too many responsibilities to pay attention on a day-in, day-out basis to the myriad of details at play. However, those who are charged with implementing the program need to know that they can refer issues to their top leaders on a timely basis, if they cannot be resolved otherwise. Having a program established as a top government priority, with agreed deadlines, helps to establish that link. However, having a coherent interagency group, established in the National Security Council and meeting on a regular basis, cements it.

We do not know how many remote sites storing HEU are being scouted today by agents of terrorist organizations or countries seeking to acquire the bomb. However, we cannot and should not take any chances. We should have the same urgency today that we had in 1994, and model the structure of GTRI negotiating teams on the tiger team concept that was so successful in Project Sapphire.

Conclusion

In conclusion, I would like to stress that the Global Threat Reduction Initiative is a program of great promise, but just over a year after its launch, it needs attention and firm hands if it is to fulfill that promise. The first and most important step is for the program to achieve a stable and reliable funding base, which the Bush Administration has been working to accomplish. It is my view that such a funding base, if it were stable at $30-40 million per year over the Administration's current request of $98 million, would provide for an accelerated removal of HEU from the most vulnerable sites in four years rather than ten.

But additional steps beyond money will be needed to achieve that acceleration. I have emphasized in this testimony the need for more intensive and nuanced diplomacy. Probably the most important factor in achieving this goal would be for the Administration to take full account of the other actors who would be available to contribute to the acceleration. Other countries might be willing to take responsibility for storing or disposing of the material, and private companies or non-governmental organizations might have a more efficient way of achieving success in the various take-back projects. Although it is difficult to manage a large group of players, making use of this wider community is the only way in which, in my view, the Administration will be able to accelerate the program. In order to do so, of course, complications and delays in organizing contracting will have to be decisively addressed.

In contracting as in other areas, however, the Administration has plenty of experience on which to draw. The experience of over a decade of threat reduction cooperation with the Russian Federation and other countries in the former Soviet Union and the G-8 has provided ample opportunity to work through difficult contracting and sub-contracting mechanisms. Some of this experience can no doubt be turned to the Global Threat Reduction Initiative.

Indeed, to structure the acceleration, the Administration need only turn to the example of the most successfully implemented "global clean-out" activity so far, which was also the first—Project Sapphire. The responsible use of experienced government and laboratory personnel, empowered to make key decisions under the oversight of a high-level interagency group, was the most important factor ensuring that 581 kgs of highly enriched uranium left Kazakhstan within six months of the start of the project. If multiple tiger teams of this type could be formed, and could operate on a carefully coordinated basis in several countries at once, then removal of HEU from the most vulnerable sites could be completed in four years.

Thank you for this opportunity to testify. I look forward to your questions.